

make it quick enough in its action. To improve it in this respect a method was introduced whereby the most of the insoluble tri-calcic phosphate of bone was converted into soluble mono-calcic phosphate. This was accomplished by treatment with sulphuric acid and the product became known as superphosphate or acid phosphate. Gradually the cheaper rock phosphate has replaced the bone meal in the preparation of the acid phosphate, until to-day comparatively little of the bone meal is being used for this purpose. The bone in the finely ground condition is really too valuable applied direct to be used in this way, especially as the tri-calcic phosphate of the rock material treated with the sulphuric acid forms just as available a form of plant food as would be got from the bones. Most of the superphosphates on the market contain about 14 to 16 per cent. available phosphoric acid. The chief advantage of this material over the undissolved forms is that the phosphoric acid is quickly available. Basic slag cannot be used for this purpose because it contains a large amount of iron, and under the treatment with sulphuric acid phosphoric acid would be converted into the iron phosphate, which would be much more insoluble than in the form in which it was originally held. The ground bone and basic slag are not quick enough in their action to fully meet the needs of quick growing crops, but may be used with such crops as grow through long periods, as meadows, orchards, vineyards, etc. The rock phosphate will be still slower in its action, and should be applied to soils that are fairly rich in organic matter, because under these conditions the phosphoric acid may be brought into solution by the acids which are formed in the decay of the organic matter. Basic slag should also be applied to soils rich in organic matter, or even to those which have a tendency towards sourness, as it contains a considerable amount of lime.

Superphosphate, on the other hand, should never be applied to soils that are inclined to be sour, because it is of an acid nature. The chief advantage of the superphosphate over the other forms is that it contains soluble phosphate which dissolves on being placed in the soil, and is thus more evenly distributed through the ground than can be done by mechanical distribution. In a longer or shorter time it is reverted to the insoluble form in which it was originally, but in the meantime it has become so distributed through the ground that the roots can come more in contact with it and it is better absorbed.

POTASH MANURES.

Until the discovery of the potash mines in Germany in 1860, wood ashes were the chief source of this constituent as a fertilizer. To-day, practically all potash salts used in the world comes from the famous mines in Germany. It is placed on the market in a variety of forms, but the chief materials that reach this country are kainite, muriate of potash and sulphate of potash.

The *kainite* is a crude salt containing about 12.5 per cent. of actual potash, which is largely in the form of the sulphate. Along with it, however, there are large quantities of ordinary salt and small percentages of chloride and sulphate of magnesium. Freight rates make it almost prohibitive to bring this product inland.